

**PLANAR LIGHTWAVE WAVELENGTH DEVICE USING MOVEABLE
MIRRORS**

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ABSTRACT

10 A method and apparatus are disclosed for adjusting the phase of an optical
signal by varying the path length of the optical signal using one or more moveable mirrors.
The phase adjustment techniques of the present invention may be employed in various
optical devices, including $1 \times n$ optical switches. The position of the mirrors may be
controlled, for example, using micromachined control elements that physically move the
mirror along the lightpath. An exemplary 2-by-2 optical switch includes two waveguides
configured to include a coupler region. A mirror is positioned at the output of each
waveguide. The position of at least one of the mirrors may be adjusted along the optical
15 path and the mirrors reflect the light exiting from the end of the waveguides back into the
same waveguide after an adjustable phase delay due to the round trip through an adjustable
air gap between the waveguides and corresponding mirrors. A received optical signal is
split in the coupler region into two generally equal components and the phase of at least
one component of the optical signal is adjusted by controlling the relative position of the
20 mirrors. The optical components are then recombined and the optical signal appears at the
appropriate output port of the optical switch. The present invention may also be applied in
wavelength selective optical switches that support multiple optical channels. A number of
techniques are also disclosed for fabricating optical devices in accordance with the present
invention.

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